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NEW SUILLINE REMAINS FROM THE MIOCENE OF NEBRASKA.

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In a paper laid before the American Philosophical Society on February 17, 1888, Professor Cope proposed a new generic name for some Peccaries from the John Day formation. From his statement it appears that these Oregon forms agree in certain cranial characters with *Hyotherium* von Meyer (*Palæochærus* Pomel) of the Miocene of Europe.

The material of this group known at present is still too imperfect, and in some cases the descriptions are too brief, to determine the validity, or non-validity, of the generic separations of *Thinohyus* Marsh[1] and *Bothrolabis* Cope.[2] From the brief descriptions and figures which Marsh gives of the two species *Thinohyus lentus* and *socialis* from the John Day, the writer infers that that genus and *Bothrolabis* are very closely related, if not the same. It is, however, best to await the discovery of more complete material, before positively expressing an opinion as to the relations between the different genera, which have been proposed by various authors. In dealing with these suilline animals, *Thinohyus* being the prior name used, I propose provisionally to treat *Bothrolabis* as a synonym.[3]

The object of the present paper is (1) to fully describe the principal characters of

[1] *Amer. Jour. Sci.*, IX., p. 248, 1879.

[2] *Proc. Amer. Philos. Soc.*, Vol. XXV., p. 66, 1888.

[3] W. J. Sinclair in a recent paper (Bull. Dept. Geol., Univ. Cal., Vol. IV., p. 135, 1905), has already arrived at similar conclusions.

the porcine remains, which have been found in the Loup Fork Miocene of Nebraska by the field parties of the Carnegie Museum, working from time to time in that formation since 1901 up to the fall of the present year (1905); (2) to carefully compare the osteological characters of the new material with those already known to occur in the different species of the same genus from the John Day Miocene of Oregon; (3) it is intended, if possible, to more closely correlate and confirm the idea of Mr. Hatcher as to the relationship of these two formations.[4] By careful comparison and deduction it would seem that at least a portion of the Upper John Day is represented in the lower horizons of the Miocene sandstones of western Nebraska and eastern Wyoming.[5]

Thinohyus (B.) subæquans? Cope. (Figs. 1, 2 and 3.)

See Cope, Proc. Am. Phil. Society, Vol. XVIII., pp. 374–375, 1879; Vol. XXV., pp. 67–70, 1888.

This species is represented in the paleontological collections of the Carnegie Museum by a left mandible, No. 913. The specimen is doubtfully referred to the above species. It was found in the lowermost Nebraska beds on the Niobrara River, Sioux County, Nebraska. This horizon is undoubtedly of a much later age than the uppermost John Day of Oregon. The ramus is not in good preservation, but enough is present to determine its generic position. The following detailed description answers closely to that of *Bothrolabis trichænus*[6] Cope, but as there is no diastema back of p_2 it is well to temporarily associate the specimen with *B. subæquans*. If subsequent study of better material proves this determination to be erroneous, the name *T. brachyceps* may be substituted.

The alveolar border for the incisors is entirely wanting, as are also the canine, the first, (if there was a p_1), and second premolars. P_3 is damaged, p_4 and m_1 are complete. M_2 is slightly broken, and m_3 has lost its internal face. The angle of the jaw is broken off. The alveolus for the canine indicates a very robust tooth which corresponds perfectly to Cope's description. The alveolar border is damaged just back of the canine, so that the absence or presence of p_1 cannot be certainly determined. Cope states that this tooth in *B. subæquans* has one root, and has diastemata before and behind it, but the writer is inclined to think, in view of the considerably later age of the geological horizon in which the Nebraska specimen was found, that this tooth may in this specimen have

[4] *Proc. Am. Philos. Society*, Vol. XLI, p. 118, 1902.

[5] In a paper now under preparation by the writer more complete data summing up the paleontological evidence on this question will be published. (See *Annals Carnegie Museum*, Vol. III., Part 4.)

[6] *Proc. Amer. Philos. Society*, Vol., XXV., pp. 74–77, 1888.

been discarded in the process of modification. P_2 is separated from p_1 by a short diastema, and the tooth had two roots. P_3 indicates a tooth with a compressed simple crown. There is a considerable posterior heel and a slight cingulum on the antero-internal face of the tooth. P_4 has two main cusps, proto- and deuteroconids, well appressed, forming a cross-crest anterior to the middle of the crown, as in

FIG. 1. Oblique internal view of left mandible of specimen No. 913, Carnegie Mus. Cat. Vert. Fossils ½ nat. size.

FIG. 2. External view of left lower mandible of specimen No. 913, Carnegie Mus. Cat. Vert. Fossils. ½ nat. size.

Cope's description of *Bothrolabis trichænus*. Anteriorly on this tooth there is also a small basal cusp and the cingulum on the postero-exterior angle of the tooth is thrown into a short fold forming a minute tubercle. The elevated ridge on the posterior heel, the metaconid, is perhaps more in the middle longitudinal line than, according to Cope, seems to be the case in his *Bothrolabis trichænus*. M_1 is a much worn tooth; the wear of the triturating face, however, indicates the usual quadri-tubercular style of tooth. The antero-posterior diameter is but slightly greater than that of P_4. The anterior half of m_2 is damaged internally and externally. The hypo- and entoconids are well separated on the broad grinding face, and just back of these, at the posterior border of the tooth, there is a small median cusp, the hypoconulid. In the valley between the anterior and posterior cusps is a swelling of the worn surface which indicates a small median conulid. On the internal margin opposite to this cusp is a basal pillar which fills up the bottom of the transverse valley. No other evidence of a cingulum is present on the tooth. The antero-posterior diameter of m_2 is slightly greater than that of m_1. The increase of the antero-posterior diameter of all the teeth is very gradual, as p_2 is only 5 mm. shorter than m_1. M_3 corresponds to that of *Bothrolabis trichænus* which Cope described as having "two pairs of cusps and a large heel." The paraconid can also be outlined on the tooth near the anterior cingulum. This

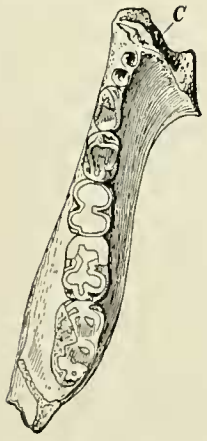


FIG. 3. Superior view of left lower mandible of specimen No. 913, Carnegie Mus. Cat. Vert. Fossils. ½ nat. size.

cingulum is interrupted on the antero-internal angle by a separate minute conulid. No other evidence of a cingulum is present on the internal side of this tooth. The external face is broken off. The enamel is slightly mammillated on the internal margin of the posterior heel; otherwise the enamel is smooth. The different tubercles of the heel are quite solidly fused together, leaving a broad triangular cross-valley back of the two posterior cusps.

The symphysis of the lower jaw is quite heavy, and indicates that the mandibular rami in this region were very broad. On the whole the ramus is rather short antero-posteriorly and deep vertically. The masseteric fossa does not extend below the line of the dentition and is indicated on the jaw fragment to be rather deep.

MEASUREMENTS.

Total length of jaw fragment		129	mm.
Depth of jaw at P_2		35	"
" " " " M_2		43	"
Length of molar-premolar series, approximately		100	"
" " premolar series, approximately		46	"
" " true molar series		54	"
Antero-posterior diameter of P_3		12	"
Diameters of P^4	antero-posterior	14	"
	transverse	10	"
" " M_1	antero-posterior	15	"
	transverse	11	"
" " M_2	antero-posterior	17	"
	transverse	13	"
" " M_3	antero-posterior	22	"

Thinohyus (Bothrolabis) siouxensis, n. sp.

The type of this species is based on a nearly complete skull and lower jaws (No. 1423, Carnegie Museum Catalogue of Vertebrate Fossils). The specimen was discovered by Mr. J. Grim, Jr., and was presented by him to the writer. It was found in the upper part of the Harrison horizon on the upper Niobrara River, Sioux County, Nebraska. The specific name indicates the type locality from which it came.

Some characters of the specimen might be regarded as of generic value, viz., the absence of P_1*, but it is thought best to await the discovery of more complete skeletal material before a final decision regarding its true affinities is had.

*The position and shape of the glenoid cavity and the posterior narial opening are similar to those in *Platygonus leptorhinus* Williston.

PRINCIPAL SPECIFIC CHARACTERS.

$I\frac{3}{3}$, $C\frac{1}{1}$, $P\frac{4}{3}$, $M\frac{3}{3}$. Occiput high. Region in front of the orbit elongated, with even slope of the skull, from the inion to the tip of the nasals; frontal region flat between orbits, with deep grooves leading from supraorbital foramina to very nearly the end of the nasals. The posterior margin of the orbit lies immediately in front of a line drawn vertically from the anterior border of the glenoid cavity; the infraorbital foramen is large, placed obliquely, and situated above the posterior part of P^4. The posterior narial orifice has an extreme posterior position. P^1 single-rooted and quite close to the canine, and there is a space separating it from P^2. P^2 is in a continuous series with the teeth back of it. P_1 is absent.

CRANIUM.

The general contour of the cranium is quite similar to that of the peccary, *Dicotyles tajacu* (Linnæus), especially the region anterior to the orbits. The comparatively small size of the brain cavity, the high, sharp, and evenly sloped sagittal crest, together with the simple premolars, are characters which are striking, and at once separate this genus from the recent peccaries. The occiput is high and has a spoon-shaped excavation above the foramen magnum. The lateral occipital crest is very prominent. From the junction with the sagittal crest it descends outward and downward for a short distance, then almost vertically downward nearly to the condyle, diminishing in prominence in the latter direction, so that the surface of the exoccipital is comparatively smooth 10 mm. above the base of the occipital condyle. The posterior temporal ridge forms a weak junction with the lambdoidal crest halfway between the occipital condyle and the inion. The strong posterior temporal ridge points more strongly towards the conditions in the recent peccary and the hog than to those seen in the John Day species, according to Cope's description of the latter.

The base of the skull is injured. The occipital condyle is present, but the contact is destroyed.[7] The condyle is rather small and exhibits characters very similar to those in the peccary. There was probably a moderately large-sized foramen magnum, which separated the condyles proportionately less than in the peccary and the hog. The baso-cranial axis has a much greater angle than is seen in *Dicotyles tajacu*. This is due to the position of the posterior nares, which are relatively much farther back in *Thinohyus siouxensis* than in *Dicotyles*.

The sutures in the cranium under discussion are entirely obliterated so that the outlines of the elements cannot be traced. The basioccipital is broken posteriorly.

[7] The condyle is restored in its approximate position with plaster.

Anteriorly it apparently narrows rapidly, and there is a small rough tuberosity with a narrow groove through it in the median line. The basi- and presphenoids evidently have much less lateral extent than in recent genera, as the space between the tympanic regions is quite narrow. The foramina opticum and rotundum are close together; the latter is quite large. Inferiorly the sphenoids send out strong wing-shaped laminæ. These alæ are firmly joined to the squamosal at the internal base of the glenoid cavity and extend forward and downward, and obliquely outward, to again form a strong contact with the posterior part of the maxillary and the pyramidal process of the palatine. Some of the John Day species have a similar structure in this region according to Cope.[8] The region of the posterior nares of *Thinohyus siouxensis* is one of the chief characteristics of the species. The posterior exit of the orifice is between the anterior part of the tympanic bullæ, and its almost vertical direction is indicated by the large swelling on the sphenoids at the posterior boundary of the orbital fossa. In the peccary and *Platygonus leptorhinus* this orifice is located well posteriorly, but not so far back as in *Thinohyus siouxensis.*

The posterior narial border is divided anteriorly into three deep triangular grooves; one in the middle and one on either side of an osseous septum. The outside grooves are bounded externally by the deep wall of the inferior alæ of the sphenoids referred to above. The foramen ovale and lacerum anterius are located at the anterior base of the tympanic bulla and are hidden from view by the extreme forward extension of the latter. The entire occipital region of *Thinohyus siouxensis* is narrow in comparison with that of the recent peccary and the hog. The supraoccipital continues upward apparently to the top of the occiput, uniting with the parietal as in *Sus scrofa* Linnæus and *Phacochœrus æthiopicus* Linnæus. In the peccary the supraoccipital does not extend so high and is met by the downward curve of the parietal bones. The parietals in the fossil are irregularly convexo-concave. Superiorly, they terminate in the sharp sagittal crest; posteriorly they are much extended, to help form the greatly overhanging occiput. The zygomatic arch of the squamosal is very robust, especially behind. Below there is a well-formed glenoid cavity, similar to that in *Platygonus leptorhinus* and the peccary, displaying an oblique saddle-shaped surface like the glenoid cavity in some carnivora. Supero-posteriorly the arch terminates in a high, transversely broad, and thin point, with the apex gently rounded. At the base of this process (the origin of the posterior temporal ridge) on the posterior face of the arch is located the rather small external auditory meatus. Postero-laterally, the frontals show sharp and prominent temporal ridges. These ridges terminate anteriorly in the rounded and somewhat elevated supercili-

[8] *Proc. Amer. Philos. Soc.*, Vol. XXV., p. 72, 1888.

ary border. The postorbital process is more prominent than in the recent forms and is trihedral in section. It terminates inferiorly in a sharp point somewhat posterior to the postorbital process of the jugal. The orbit is open posteriorly by a space of 12 mm. between the apices of the processes on the frontal and jugal. The posterior half of the frontals is flat and they are surrounded by the superciliary borders laterally, and by the prominent temporal ridges posteriorly. Anteriorly they gradually become convex to meet the maxillaries and nasals. The supra-orbital foramina are close together and the deep furrows which lead from them extend very nearly to the end of the muzzle.

The jugal has a considerable depth below the orbit. The postorbital process is strongly developed. The latter is heavy antero-superiorly and tapers gradually on the external and internal faces, forming a rather thin posterior edge. The process terminates in a subacute point. The orbit is oblique, irregularly oval, and of considerable size. On the anterior border the lachrymal tubercle divides the border into two emarginations. The one above the process is shallow, but the one below it is deeper, especially in the external face of the lachrymal. In this rounded emargination is also located the lachrymal foramen. The zygomatic arch is not so abruptly terminated at the lachrymal as in the hog, but continues in a gentle sweep forward to meet the superior border of the maxillary. The temporal fossa is proportionally much deeper than in the recent genera, while the orbital fossa is of about the same depth. The spheno-maxillary fossæ in *Thinohyus siouxensis* are extremely deep, and divided by a thin septum of bone on the median line of the cranium placed antero-posteriorly and vertically. The posterior opening of the infraorbital foramen is large. The facial region of the skull shows no sutures. The alveolar border is low, and does not extend as far back as in the peccary and the hog. The deep fossa in front and below the lachrymal which appears in *Dicotyles tajacu* is much less pronounced in *Thinohyus siouxensis*. The fossa in *Thinohyus siouxensis* is further forward. The infraorbital foramen is large, obliquely placed, and situated above the posterior part of p^4. The alveolus of the canine presents, on the external face of the maxillary, an abrupt prominent swelling. Back of this eminence is a faint horizontal ridge, which is an indication of the much stronger ridge in the recent peccary. Immediately anterior to the canine alveolus is the deep groove for the reception of the inferior canine.

The premaxillaries are heavy and greatly produced in front of the canine. The anterior palatine foramina are separated by a strong bony ridge; they are round and of considerable size. The posterior palatine foramina are close to the alveolar border and are opposite the anterior part of m_2. The palate is long and narrow,

very slightly arched, and has a lightly rugose surface. There is practically no difference in the width of the palate from i^3 to back of m^3.

The tympanic region is strongly supported by the postero-internal portion of the squamosal. The tympanic bulla is of large size, filled with cancellous tissue, and is closely appressed to the postero-internal angle of the postglenoid process. Anteriorly the bulla overhangs the posterior nares in a peculiar manner, entirely hiding from view the lateral borders of the orifice. The postglenoid foramen is situated on the posterior edge of the postglenoid process, between the latter and the tympanic region. The foramen lacerum posticum and the condylar foramen are close together and are situated, the former internal to, and the latter immediately back of, the base of the paroccipital process. The foramen lacerum posticum is at the posterior boundary of the tympanic bulla.

MANDIBLE.

The lower jaws of the type are in good preservation, except the posterior part of the angle which is broken off and lost. The rami are completely coössified leaving no trace of the symphysis. The latter is long and curves evenly with the backward sweep of the horizontal ramus. The latter as a whole, is rather long and slender, diverging only slightly posteriorly, and has a short constricted area back of the canine alveole. The alveolar border is nearly horizontal back of the diastema. The latter has a considerable drop below the line of the border, causing on the external face of the ramus a constriction similar to that in *Dicotyles tajacu*. The external face of the alveolar border is reinforced by a rugose ridge extending nearly the entire length of the border. This feature is also met with in the peccary. The internal face of the horizontal ramus is slightly convex. The external surface is divided posteriorly by a prominent rounded ridge, which disappears below p_4, being replaced by a smooth surface. The inferior border of the ramus forms a sinuous line, as the angle has a considerable internal flexure. There are three mental foramina almost in a horizontal line, and situated below and in front of p_2.

The ascending ramus is strong, its anterior border, or base of the coronoid process, has a prominent ridge extending well forward on the external face of the ramus as stated above. The temporal fossa is deep; it is of considerable antero-posterior dimension, but does not extend below the line of the alveolar border of the jaw. The top of the coronoid process is broken off, but the base at the sigmoid notch indicates a rather broad antero-posterior surface. The mandibular condyle has a small antero-posterior diameter, while the transverse diameter is considerable. The coronoid process rises close to the anterior base of the condyle, forming a small superior sigmoid notch.

Measurements.

Length of skull from occiput to end of premaxillary bone	300	mm.
" from occipital condyle to end of premaxillary bone, approximately	260	"
" " lambdoidal crest to postorbital process on the frontal	91	"
" " postorbital process on the frontal to end of premaxillary	215	"
Total length of alveolar border including premaxillary	156	"
Length of palate from posterior narial orifice to anterior end of premaxillaries	212	"
" " " " anterior border of posterior nares to the end of the premaxillaries	160	"
Greatest transverse diameter of occiput at lambdoidal crest	44	"
" " " of brain-case	49	"
" " " of frontals at postorbital processes	88	"
" " " of muzzle at lachrymal bone	85	"
" " " at end of muzzle	31	"
" " " of one condyle	21	"
Greatest diameter of cranium at tympanic region	69	"
Transverse diameter at glenoid cavity	119	"
" " of palate at m^3	22	"
" " " " " p^2	22	"
" " " " " i^3	22	"
" " of muzzle at canines	58	"
" " " " " incisors	35	"
Greatest length of mandible, approximately	195	"
Length of mandible from incisor alveolar border to base of coronoid process back of m_3	148	"
Length of symphysis	53	"
Depth of ramus in front of p_2	28	"
" " " back of m_3	45	"

SUPERIOR DENTITION.

Plates XXXIV.–XXXV.

Unfortunately the incisors, canines, and premolars one and two are laeking in the type. The alveoli are all preserved and indicate a large pair of median and smaller lateral incisors; a heavy canine with the antero-posterior diameter greater than the transverse, the alveoli being oval in outline. The alveolus for p^1 is subovate, with the greatest diameter antero-posteriorly; it is close to the canine alveolus and on a line with the internal border of that tooth. P^1 was undoubtedly single-rooted. P^2 is separated from p^1 by a diastema of 5 mm. and has two roots as is indicated by the double alveolus. It had very nearly the same antero-posterior diameter as p^3. The latter tooth is firmly implanted in the maxillary by three roots. The antero-posterior diameter is a little greater than the transverse and the tooth has an oblique position. It is sub-triangular in outline with the apex antero-internal. The protocone is prominent and the posterior eingulum is modified into a broad ledge with the greatest diameter postero-internal. The tooth

is entirely surrounded by a heavy cingulum. The enamel is smooth. P^4 is wider than long, as in *Thinohyus pristinus* Cope. The triturating surface of the tooth is worn down, but indicates a single external cusp, the protocone. The deuterocone is also strongly developed, and there are heavy anterior and posterior cingula. There is an external cingulum, while the tooth is smooth on its internal side.

The first and second superior true molars are much worn. The grinding surface of the former is in its worn condition a large basin surrounded by heavy enamel. The cones are entirely obliterated, but the external remnant of the transverse valley indicates a quadritubercular crown. The cingulum on the postero-external lobe is present, while that on the antero-external lobe is wanting. The internal face has no cingulum. M^2 has strong external and internal remnants of the transverse valley, extending well in on the triturating surface presenting nearly an antero-posterior 8-shaped basin. There is an anterior and posterior cingulum. Externally the cingulum is weakly developed and internally the tooth is smooth. M^3 has the greatest antero-posterior diameter of all the teeth in the upper jaw. The para- and protocones of m^3 are well worn, but indicate that they were well separated and of considerable size, especially the paracone. The meta- and hypocones are of smaller size and are closer together. The abrasion on this tooth indicates the former presence of a metaconule. The anterior half of the grinding face is too much worn to justify the statement that a protoconule was present. There is a heavy anterior cingulum and a strong posterior heel. There is no internal cingulum, while the external is faint. The tooth is broadest anteriorly and tapers rapidly on the external face from the paracone to the evenly rounded heel. The internal border is an almost straight antero-posterior line.

INFERIOR DENTITION.

Plate XXXIV.

All the incisors of the lower jaw and also the canine on the left side are wanting. The right canine is present, but with the top broken off. This is a heavy and almost vertically placed tooth, very deeply imbedded in the mandible. Its antero-posterior diameter is greater than the transverse. There are shallow grooves on the tooth, one on the internal and one on the external face. The anterior border is narrow and evenly rounded, while the posterior border is broad and more angular, thus presenting a sub-triangular cross-section. There is a deep oblique abrasion on the posterior face caused by friction with the superior canine. P_1 is absent. There is a long diastema from the canine to p_2. The latter is in a continuous series with

the teeth back of it and is implanted in the ramus by two fangs. The single protoconid is greatly developed, taking up the principal part of the crown. Anterointernally there is a minute cingular conulid ; while posteriorly the cingulum is quite strong. The external and internal cingula are wanting or only faintly indicated. P_3 has, as in p_2, only the large protoconid with the anterior cingulum heavier and the posterior heel much better developed than in the tooth in advance of it. The external cingulum is strong, and internally there is no cingulum, except on the postero-internal angle, which, together with the posterior ledge, forms a small basin on this part of the tooth. On p_4 the proto- and deuteroconids are closely fused, forming a cross-crest, which is much worn in the type. There is a strong anterior base, and the metaconid is situated almost on the middle of the posterior base. No external or internal cingula appear on this tooth. M_1 is too much worn for accurate description. There was evidently no external or internal cingulum on this tooth M_2 has the proto- and metaconids equally developed, while the paraconid is a minute element. Posteriorly the tooth is nearly as broad as anteriorly, the hypo- and entoconids being well separated. The posterior and anterior cingula are heavy. The bottom of the transverse valley is filled up externally by the cingulum ; there are no other external or internal cingula on this tooth. Molars one and two in the mandible have a quadrate appearance, while m_3 has a long sub-triangular form, which is due to the greatly extended posterior heel. The proto- and metaconids of the latter tooth are more elevated than the hypo- and entoconids. The postero-internal angle of the heel is again elevated, so as to form a broad transverse valley back of the hypo- and entoconids. The heel is solidly fused. The open transverse valley between the proto- and hypoconids is taken up medially by the hypoconulid, as is indicated by the wear on the triturating surface. There is a heavy anterior cingulum. No other cingula are present on this tooth.

Measurements.

Superior Dentition.

Total length of the upper dentition		155	mm.
Antero-posterior diameter of the three incisor alveoli		24	"
Diameters of the canine	antero-posterior	15	"
	transverse	10	"
Antero-posterior diameter of molar-premolar series		105	"
" " " " the premolars		53	"
Diameters of p^3	antero-posterior	14	"
	transverse	12	"
" " p^4	antero-posterior	13	"
	transverse	17	"

" " m^1	antero-posterior	16	"
	transverse	15	"
" " m^2	antero-posterior	1·	"
	transverse	15	"
" " m^3	antero-posterior	18	"
	transverse	18	"

INFERIOR DENTITION.

Total length of the lower dentition		146	"
Antero-posterior diameter of incisor alveoli on one side, approximately		12	"
Diameters of canine	antero-posterior	12	"
	transverse	9	"
Diameters of p_2	antero-posterior	11	"
	transverse	5	"
" " p_3	antero-posterior	13	"
	transverse	7	"
" " p_4	antero-posterior	14	"
	transverse	9	"
" " m_1	antero-posterior	16	"
	transverse	12	"
" " m_2	antero-posterior	18	"
	transverse	15	"
" " m_3	antero-posterior	23	"
	transverse	14	"

In the paleontological collection of the Carnegie Museum is another specimen, No 1418, Carnegie Museum Catalogue of Vertebrate Fossils (see Fig. 4), which I refer to the same species described above. The specimen was found on the Agate Spring Stock Farm, Sioux County, Nebraska, by Harold J. Cook, Jr., and was presented by him to the writer. The specimen, having (although badly worn) incisors, a canine, and premolars in the upper jaw, and canines, and all the premolars in the lower jaw, supplements the type in important respects. Although the skull is distorted, it gives the complete length of the premaxillary and the nasals, which are damaged in the type. Anteriorly the nasals appear to be narrow, and terminate in a short subacute point, which slightly overhangs the anterior nares. In spite of the crushed condition of the skull it is possible to recognize characters like those encountered in the type of *Thinohyus siouxensis*. In No. 1418, the specimen under discussion, the excavations for the lower canines are deeper, and the anterior palatine processes of the maxillaries, immediately anterior to the canines, appear to be somewhat more constricted, than in the type. The distortion may possibly be in part the cause of this appearance.

The animal was an old individual, as is plainly indicated by the extremely worn condition of the teeth. The crown of the median incisor in its worn state has the appearance of a large, short, subcircular cylinder, with a strong curved fang deeply

imbedded in the heavy premaxillary. The triturating surface is convex in all directions by wear. The external margin has received the greatest abrasion. I^2 is less worn, is much smaller than i^1, and has a basal cingulum on the postero-internal angle. I^3 is the smallest of the series. This tooth is more ovate in cross-section, the antero-posterior diameter being the greatest. The crown is surrounded by enamel which terminates posteriorly in an acute angle. There is no cingulum. The principal wear is located obliquely on the anterior half of the crown. All the incisors are divided by short diastemata. The canine of this species is very heavy, rivaling that of *Dicotyles tajacu*. In the fossil the cross-section of the tooth is a more rounded oval than in the recent genus, but, as in the latter, the posterior border is narrower than the anterior. There is a long gradual abrasion caused by friction with the inferior canine on the anterior face, which terminates in a rather

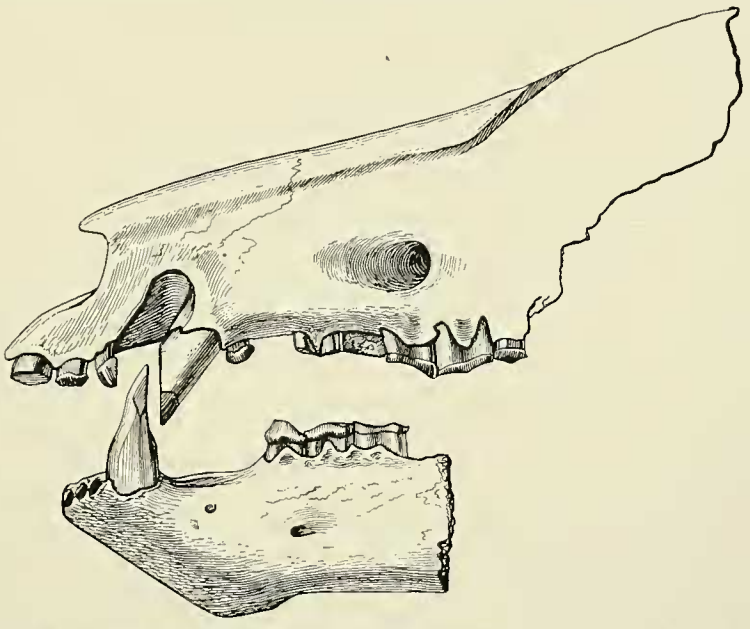


FIG. 4. Anterior portions of the upper and lower jaws of specimen No. 1418, Carnegie Mus. Cat. of Vert. Fossil. ½ nat. size.

blunt point, with traces of additional wear on the external face. Twelve mm. above the point of the right canine, on the external face, is a peculiar broad open abrasion, extending quite across the tooth antero-posteriorly. On the left tooth is a corresponding abrasion not nearly so well defined. These rubbed surfaces may indicate the habits of the animal, at least I cannot account for the wear, except by supposing that the canine was used for rooting. P^1 is separated from the canine by diastemata, a very short one in front and a longer one behind. This tooth is one of the chief characteristics of this species. It is a small tooth with the single pro-

tocone, which has received very little wear on account of the absence of p_1. There are no cingula, except on the anterior and posterior angles on the internal side. The tooth is implanted in a single alveolus. The two roots are closely coalesced, with a groove indicating the separation of the roots in the species of earlier Tertiary times. The premolars and molars back of p^1 are so badly worn that they present no characters capable of description.

The fragment of the lower jaws which belongs to this specimen (No. 1418) indicates an animal somewhat larger than the type. The ramus is somewhat deeper and the diastema back of the canine is longer than in the type specimen. The diameters of the teeth are practically the same as in the type. The principal features of the fragment are the solidly fused chin and the absence of p_1, showing a correspondence to the type. The canine reveals a long abrasion on the antero-external angle which has removed part of the enamel, forming of the remaining enamel a diamond-shaped surface at the summit of the tooth.

Measurements.

Length of skull from supraorbital foramen to end of premaxillaries	200	mm.
" " " " infraorbital foramen to end of premaxillaries	112	"
" " alveolar border from m^1 to end of premaxillaries	108	"
Antero-posterior diameter of the incisors	27	"
Diameters of 1^1 antero-posterior	10	"
" " 1^1 transverse	9	"
" " 1^2 antero-posterior	7	"
" " 1^2 transverse	6_5	"
" " 1^3 antero posterior	5_5	"
" " 1^3 transverse	5	"
" " canine at base antero-posterior	14	"
" " canine at base transverse	10	"
" " p^1 antero-posterior	6	"
" " p^1 transverse	4	"
" " c_1 antero-posterior	13	"
" " c_1 transverse	10	"

DISCUSSION OF RELATIONSHIP.

It will be safest to await the discovery of more perfect material representing this group of Miocene peccaries before expressing a positive opinion as to their affinities. There are two types of the genus *Thinohyus*, a dolichocephalic and a brachycephalic. Professor Cope separated *Thinohyus decedens*, generically from other John Day forms, giving as the principal character the absence of p^2, which is found to be erroneous.[9] Judging from the description by Cope and Sinclair, and also from the

[9] Sinclair, Bull. Dept. of Geol., Cal. Univ., Vol. IV., p. 135, 1905.

illustration [10] by the latter author, it would seem that, aside from the erroneous definition of dental characters by Cope, this species is strongly characterized by its short skull and its inflated facial region, and may, when additional material is known, justify its retention in the separate genus *Chænohyus* proposed for it by the latter author.

Thinohyus siouxensis is easily distinguished from other known species by the single-rooted p^1, which has a short diastema in front and a somewhat longer diastema behind; the unbroken sequence of p^2 with teeth back of it; the extreme posterior position of the posterior narial orifice; the large and anteriorly projecting tympanic bullæ; the posterior position of the infraorbital foramen, *i. e.*, above back part of p^4, and the absence of p_1. The skull of *T. siouxensis* is of approximately the same size as that of *T. rostratus* Cope, but the latter species differs from the former in important characters, viz., the two-rooted p^1, which is separated from the canine and p^2 by diastemata; the latter tooth also has diastemata in front and behind. The molar-premolar series is relatively shorter, and the infraorbital foramen is placed more in advance (above the middle of p^3). In *Thinohyus pristinus* Cope p_1 is small and as in *T. rostratus*, two-rooted, "the anterior root nearly reaching the posterior edge of the canine alveolus, . . . p^4 is wider than long and has but one external cusp." [11] M^3 is longer than wide, which is due to the large heel. The infraorbital foramen is located above the middle of p^3, which is another character showing similarity to *T. rostratus*. According to Sinclair *T. pristinus* is further characterized by diastemata in front and behind p_1. *T. trichænus* Cope has p^4 as long as wide, "and [the tooth] has a sub-quadrate base." [12] P^1 is small, one-rooted, and separated from p^2 by a short diastema. Premolars one and two in the mandible are each separated by diastemata in front and behind. In *Thinohyus subæquans* Cope the infraorbital foramen is nearly as far back as in *T. siouxensis*, *i. e.*, above the middle of p^4 in the former, and above the posterior part of that tooth in the latter species. *T. subæquans* is further characterized by the small two-rooted p^1, which is "almost entirely within the superior canine." [13] P^4 is wider than long, as in *T. pristinus* and *T. siouxensis*. In *T. subæquans* there are short diastemata anterior and posterior to p_1.[14] In *Thinohyus lentus* Marsh [15] "p_1 is separated from the canine and

[10] *L. c.*, Plate XVI.

[11] Cope, *Proc. Amer. Philos. Soc.*, Vol. XXXV., p. 73, 1888.

[12] *L. c.*, p. 75.

[13] Cope, *l. c.*, p. 69. (The tooth is located close to the postero-internal angle of the canine—O. A. P.)

[14] The lower jaw No. 913 in the Carnegie Museum Collection which is provisionally referred to this species is clearly that of a short-faced type such as *T. decedens*.

[15] *T. socialis* Marsh is imperfectly known. It is a John Day form of rather small size with mammillated posterior cingulum on m^3(?). (See illustration, *Am. Jour. Sci.*, Vol. XLVIII., p. 271, Fig. 25, 1894).

p_2 by diastemata of respectively 8 mm. and 10 mm."[16] *Thinohyus osmonti* Sinclair is characterized by the long diastema in front of p_1, which is double-rooted and in an uninterrupted series with the teeth back of it. "P^1 is a single-crowned, double-rooted tooth, separated from the canine and p^2 by diastemata."[17] The infraorbital foramen appears from the photographic reproduction given by Sinclair to be above the posterior part of p^3.

SUMMARY.

The study of the remains described above may be summarized as follows:

1. The animals represented by the specimens in the Paleontological Collection of the Carnegie Museum are more modified than those representing the John Day Miocene in other collections, and the former may, when more completely known be regarded as new genera.

2. The horizon in which the remains were found is the upper part of the Harrison horizon, which is regarded by Hatcher[18] as filling the hiatus between the Upper and Lower Deep River Formations. The uppermost Arikaree, or the Monroe Creek horizon, which is regarded by the same author as equivalent to the Upper John Day, has not as yet yielded any remains of peccaries. When such remains are found in the lower horizons of the Miocene in this locality, they will undoubtedly reveal characters more closely allying them to the John Day forms, thus differing from *Thinohyus siouxensis*.

The writer wishes to express his thanks to Dr. W. J. Holland, Director of the Carnegie Museum, for kind suggestions and assistance in the preparation of this manuscript for the press.

The illustrations are from drawings made by Mr. Sydney Prentice.

CARNEGIE MUSEUM, November 24, 1905.

[16] Sinclair, Bull. Dept. of Geol. Cal. Univ., Vol. IV., p. 140, 1905.

[17] Sinclair, *l. c.*, p. 139.

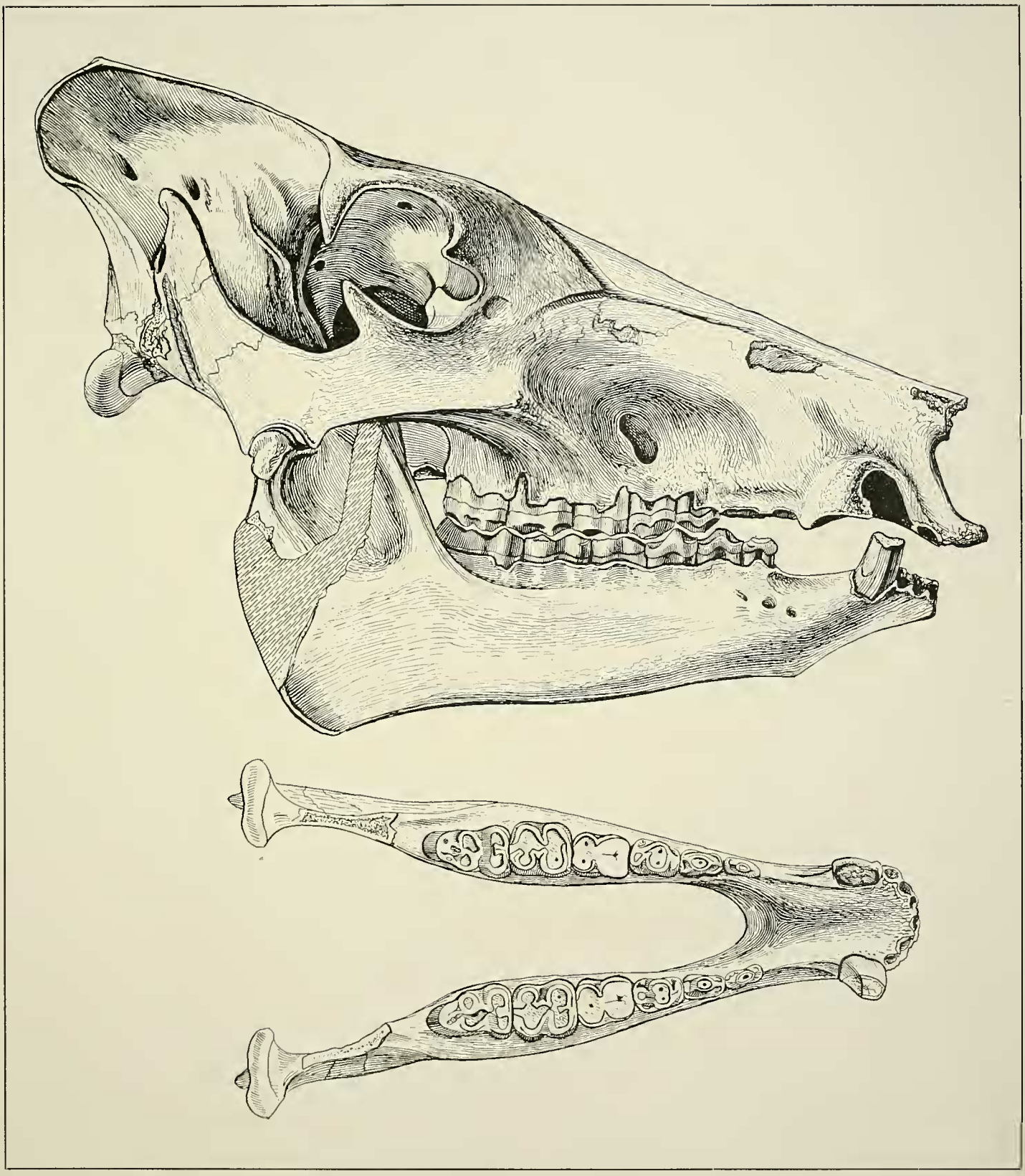
[18] *Proc. Amer. Philos. Soc.*, Vol. XLI., p. 118, 1902.

EXPLANATION OF PLATE XXXIV.

Upper figure. Right side of skull and lower jaws of *Thinohyus siouxensis.* (Type) No. 1423, Carnegie Museum Catalogue of Vertebrate Fossils.

Lower figure. Superior view of the mandible *Thinohyus siouxensis.* (Type) No. 1423.

Figures $\frac{2}{3}$ natural size.

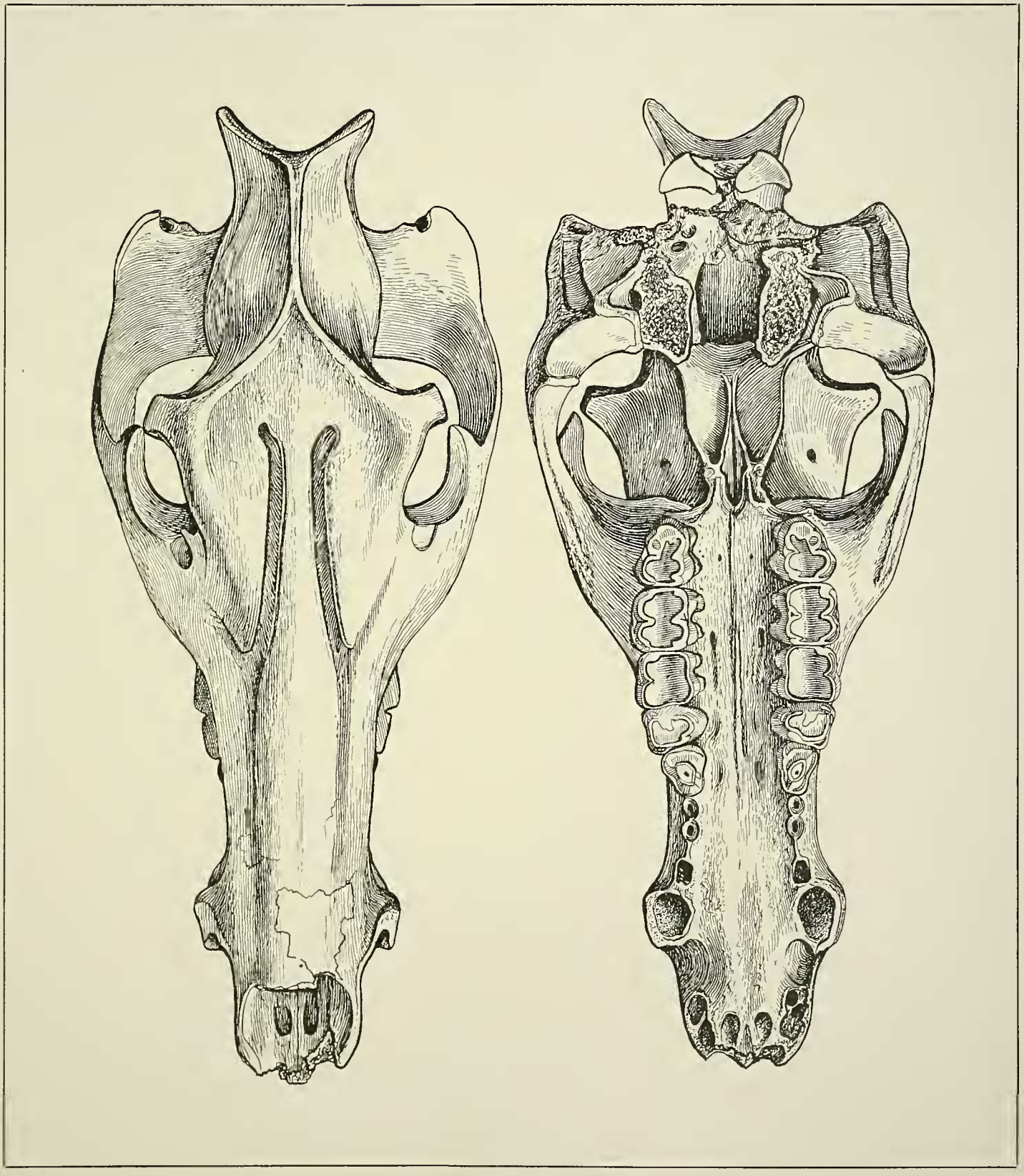


THINOHYUS SIOUXENSIS PETERSON.

EXPLANATION OF PLATE XXXV.

Figure on left. Superior view of skull of *Thinohyus siouxensis*. (Type) No. 1423, Carnegie Museum Catalogue of Vertebrate Fossils.

Figure on right. Palate view of same skull. (Type) No. 1423. Figures $\frac{2}{3}$ natural size.



THINOHYUS SIOUXENSIS PETERSON.